Attachment H
Total Residual Chlorine
Discharge Limit Calculation
NPDES Permit No. MA0103284
Boston, MA

Water Quality Limitation Equation:
$C_L = C_a + [(C_c - C_a)/(1/S_n + 1/S_b - 1/(S_n)(S_b)]$

Given:
C_L = water quality limitation
C_a = maximum ambient data sample
C_c = marine water quality criterion
C_{c1} = 13 ug/l = Acute
C_{c2} = 7.5 ug/l = Chronic
S_n = flux-average nearfield dilution
S_b = farfield background build-up dilution
Q_{e1} = Maximum Daily Flow = 990 MGD
Q_{e2} = Average Monthly Flow = 690 MGD
I_d = Initial Dilution
I_{d1} = 62.0:1 ratio, at 990 MGD, 1 part effluent to 62 parts receiving water
I_{d2} = 69.1:1 ratio, at 690 MGD, 1 part effluent to 69.1 parts receiving water
S_n = Flux-Average Nearfield Dilution
S_{n1} = (62.0 x 1.15) = 71.3:1, at 990 MGD
S_{n2} = (69.1 x 1.15) = 79.5:1, at 690 MGD
(Note: 1.15 = flux-average correction value for this diffuser outfall.)
S_b = Farfield Background Build-up Dilution for a conservative toxic pollutant
S_{b1} = 150:1, acute
S_{b2} = 256:1, chronic
= 364:1, human health

Sample Calculation:
$C_L = C_a + [(C_c - C_a)/(1/S_n + 1/S_b - 1/(S_n)(S_b)]$

Acute:
$C_L = 0 + [(13 -0)/(1/71.3 + 1/150 - 1/(71.3)(150)]$
$C_L = [(13)/(0.014025)+(0.006666)-(0.000093502)]$
$C_L = 631$ ug/l = 0.631 mg/l

Chronic:
$C_L = 0 + [(7.5 - 0)/(1/79.5 + 1/256 - 1/(79.5)(256)]$
$C_L = [(7.5)/(0.012578)+(0.0039062)-(0.000049135)]$
$C_L = 456$ ug/l = 0.456 mg/l

Therefore, the total residual chlorine limits for the tunnel outfall are: (1) maximum daily limit = 631 ug/l, and (2) average monthly limit = 456 ug/l

Footnotes:

1. Effluent limits for daily maximum total residual chlorine are based on the chronic values defined in the EPA Quality Criteria for Water, 1986 (Gold Book) as adopted into the State Water Quality Standards, multiplied by the available receiving water dilution.

2. Under Section 301(b)(1)(C) of the CWA, discharges are subject to effluent limitations based on Water

Quality Standards. The Massachusetts Surface Water Quality Standards include the requirements for the regulation and control of toxic constituents and also require that EPA criteria established, pursuant to Section 304(a) of the CWA, shall be used unless a site specific criteria is established. The state will limit or prohibit discharges of pollutants to surface waters to assure that surface water quality standards of the receiving waters are protected and maintained or attained.